Lucas Busta

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Highlights

NSF Postdoctoral Fellowship in Biology . . . Chemistry & Genomics of Plant Natural Products

SciFinder Future Leader Award . . . . . American Chemical Society CAS division

6 first-authored publications . . . . . *Phytochemistry*, *Plant Physiology*, *Plant and Cell Physiology*

8 co-authored publications . . . . . *Nature Plants*, *Plant Cell*, *New Phytologist*

11 yr. research exp. . . . . Analytical and (Bio)Chemistry, Molecular Biology, Informatics

9 yr. teaching exp. . . . . Guest Lesson Writer & Lecturer, Lab Activity Coord., Teaching Asst.

Research Interests and Teaching & Mentoring Philosophy

I am fascinated by the unique chemistry that biological systems use to survive harsh environments. My research uses informatics to unite analytical chemistry with emerging high-throughput DNA and RNA sequencing technologies to understand the biosynthesis and evolution of plant chemicals and enable biomimetic metabolic engineering. I aim to use this approach to develop and apply new knowledge about chemical biology to sustaining and improving human life.

One of the most enjoyable parts of studying chemical biology is its interdisciplinary nature. This characteristic greatly facilitates the integration of research, teaching, and learning. I consistently strive to bring learners into the laboratory and to bring research into the classroom. As part of this, I take advantage of plants' presence in our everyday lives to develop teaching materials that can be adapted for use both inside and outside the classroom: both in formal, advanced educational settings, and in public, family-friendly events.

Teaching Experience

Guest Lesson Writer, Lecturer, and Lab Activity Coordinator

- Biology 368: Plants in Human Medicine (U. Nebraska - Lincoln) 2018, 2019
  -Audience, duration: 20 undergrad. students; 20 lessons over 2 semesters, 50 minutes each.
  -Series Title: "Analysis of Plant Chemicals"
  -Role: Created and led/co-led a two-week experimental module modeling phytochemical research. Experiments (chemical extraction, thin-layer-chromatography, bioassay, gas chromatography-mass spectrometry) and data analysis (data interpretation in context of a group dataset). Co-led a subsequent week of sessions on results communication (abstract, mini-symposium, and mini-manuscript preparation). Created and delivered a lecture based on 4 review papers on plant natural products in drug discovery.

Guest Lesson Writer and Lecturer

- Biochemistry 435: Plant Biochemistry (U. Nebraska - Lincoln) 2017, 2019
  -Audience, duration: 10-12 graduate students; 4 lessons over 2 semesters, 50 minutes each.
  -Lecture titles: "Biochemistry and Evolution of Specialized Metabolism in Plants", "The Plant Cuticle", "Membrane Hemifusions"
  -Role: Created and delivered lectures designed by integrating findings and models from multiple recent scientific papers and literature reviews.
  -Instructor feedback: "Thought-provoking lessons & thoughtfully put together presentations."
- Biology 351: The Plant Kingdom (U. Wisconsin - Whitewater) 2018
  -Audience, duration: 20 undergraduate students; 1 lesson, 50 minutes.
  -Lecture title: "Plant Metabolism: Why Is It Special?"
  -Role: Created and virtually delivered an active learning-centered lecture based on recent literature (6 papers) describing biochemistry and function of plant chemicals.
  -Student feedback: "Great lecturer", "[...] very interactive.", "He made it relatable [...]"
- Biotechnology 777: Biotechnology (U. Nevada - Reno) 2018
  -Audience, duration: 20 graduate students; 1 lesson, 50 minutes.
  -Lecture title: "Practical Skills for Graduate Research"
  -Role: Designed and delivered a lecture on professional development and career strategy based on personal experience and advice received over the course graduate career.
- Chemistry 319: Practical Skills for Chem. Research (U. British Columbia) 2016
  -Lecture title: "Practical Skills for Graduate Research"
  -Audience, duration: 20 undergraduate students, 1 lesson, 30 minutes
  -Role: Designed and delivered a lecture on professional development and career strategy based on personal experience and advice received over the course graduate career.

Additional teaching training and experience (details in appendix)

- Teaching Assistant (total 12 semesters)

  Chemistry 311: Analytical Chem. Lecture/Lab II (U. British Columbia) . . . 2013, 2015, 2016
  Chemistry 235: Organic Chemistry Lab II (U. British Columbia) . . . . . 2013 - 2014
  Chemistry First Year Resource Centre (U. British Columbia) . . . . . 2011 - 2012
  Chemistry 2223: Analytical Chemistry I (U. Minnesota - Duluth) . . . . . 2009 - 2011
- Professional Online Chemistry and Biology Tutor and Lecturer (`oneclass.com`) . 2016 - 2018
- Departmental R Programming Club Instructor (U. Nebraska - Lincoln) 2017, 2018
  -Audience, duration: 20 graduate, undergraduate students, and postdocs; 2 lessons, 1.5 hr. ea.
- University and scientific society workshops (total 45 hours) . . . . . 2011 - 2019
  -Topics: active/participatory learning, teaching scientific writing, training teaching ass'ts.

Mentoring Experience

Mentor to undergraduate or graduate research or teaching assistant

- Elizabeth Schmitz (U. Nebraska - Lincoln) ..... 2019 - present
  -Duration: 6 + months
  -Skills taught: High-throughput GC-MS analysis of plant chemicals. Implementation of custom built chromatogram and mass spectrum analysis software. An iterative, critical thinking approach to experimental design and data analysis, taught using guided inquiry.
- Evan Updike (U. Nebraska - Lincoln) ..... 2018 - 2019
  -Duration: 12 months
  -Skills taught: Cloning: digests, PCR, ligation, Gibson assembly, bacterial transformation. Heterologous expression: Arabidopsis, Camelina, transgenic hairy roots. An iterative, critical thinking approach to experimental design and procedures, data analysis, and professional development/career strategy, taught using guided inquiry.
  -Subsequently: MS student, Cahoon Lab, UNL
- Evan LaBrant (U. Nebraska - Lincoln) 2017
  -Duration: 3 months
  -Skills taught: Chemical separation, structural and quantitative analysis by GC-MS (publication 12). Critical thinking about experimental procedures, data analysis, writing & presenting, and professional development/career strategy, taught using guided inquiry.
  -Subsequently: PhD student, Roston Lab, UNL
- Yabin Guo (U. British Columbia) 2016
  -Duration: 5 months
  -Skills taught: Guided inquiry approaches to teaching, assisting with upper-level chemistry laboratory courses.
- Kaylyn Leung (U. British Columbia) 2016
  -Duration: 5 months
  -Skills taught: Guided inquiry approaches to teaching, assisting with upper-level chemistry laboratory courses.

Co-mentor or part-time mentor to undergraduate research assistant

- Stephanie Futrell (U. Nebraska - Lincoln) ..... 2019 - present
  -Duration: 6 + months
  -Skills taught: Preparation of plant surface chemical samples for gas chromatography. GC data analysis and data processing. Critical thinking about experimental procedures and data analysis, taught using guided inquiry.
- Cassie McDonald (U. British Columbia) 2016
  -Duration: 5 months
  -Skills taught: Quantitative analysis of surface lipids using GC-MS and GC-FID.
  -Subsequently: Master's program in Genetic Counseling, UBC

Additional mentoring training and experience (details in appendix)

- University and scientific society workshops (total 10 hours) ..... 2018 - 2019
  -Topics: Workshop on coaching, workshop on techniques for providing quality mentoring and advising.

Research Experience

Postdoctoral Researcher

- NSF Postdoctoral Research Fellow ..... 2018 - present
  -Institution: University of Nebraska - Lincoln (UNL)
  -Mentor: Edgar Cahoon; Professor of Biochemistry; Ctr. for Plant Science Innovation, Dir.
  -Research area: Biochemistry and genomics of plant surface chemicals
  -Accomplishments:
  Discovered and functionally characterized genes mediating sorghum surface chemistry
  Characterized evolutionary patterns in grass surface chemistry and genomics
  Developed custom software for high-throughput GC-MS data processing
  Developed computational tools to link analytical chemistry and genomics
  Created citizen science project to conduct large-scale survey of plant surface chemistry
- Postdoctoral Research Associate ..... 2016 - 2018
  -Institution: University of Nebraska-Lincoln (UNL)
  -Mentor: Edgar Cahoon; Professor of Biochemistry; Ctr. for Plant Science Innovation, Dir.
  -Research area: Biosynthesis of fatty acid-derived natural products
  -Accomplishments:
  Identified and quantified novel lipid metabolites in plant tissues
  Constructed and transformed multigene expression vectors into plants
  Discovered and characterized fatty acid-derived natural product biosynthesis genes
  Wrote software to identify associations between protein sequences and catalytic specificity

Student Researcher

- Ph.D. Chemistry (Analytical) ..... 2011 - 2016
  -Institution: University of British Columbia (UBC)
  -Mentor: Reinhard Jetter, Professor of Chemistry and Botany
  -Research area: Diversity and biosynthesis of plant surface chemicals
  -Accomplishments:
  Performed detailed chemical analyses of hundreds of plant surface extracts
  Chemically synthesized standards for structure elucidation and enzyme assay
  Comprehensively reviewed and retrobiosynthetically analyzed plant surface chemicals
  Developed custom data analysis software to increase throughput, facilitating collaboration with domestic and foreign research groups.
  Gained experience with GC-MS, GC-FID, LC-ESI-MS, ToF-SIMS, and NMR.
- B.Sc. Chemistry, Biochemistry & Molecular Biology ..... 2007 - 2011
  -Institution: University of Minnesota - Duluth (UMD)
  -Mentor: John F. Evans, Professor of Chemistry
  -Research area: Customized data acquisition software
  -Accomplishments:
  Developed custom data acquisition and processing software using LabVIEW
  Documented the structure and functionality of developed software in written reports.
  Drafted LabVIEW software for spectrophotometric data acquisition and processing.

Additional research training and experience (details in appendix)

- University and scientific society workshops ..... 2011 - 2019
  -Technical skills: genomics and transcriptomics (total 24 hours), metabolomics (total 9 hours), computer programming (total 12 hours).
  -Soft skills: grant writing (total 15 hours), professional development (total 9 hours), science communication (total 10 hours).

Publications (Total = 14)

Preprints and manuscripts in review

[1] **Lucas Busta**†, Olga Serra†, OkTae Kim, Marissa Molinas, Irene Peré, Mercé Figueras*, Reinhard Jetter*. "Oxidosqualene cyclases involved in the biosynthesis of triterpenoids in *Quercus suber* cork." ..... *in review*
-Role: Structural and quantitative chemical analyses, bioinformatic analyses, prepared figures, wrote the manuscript.

[2] **Lucas Busta** and Sabrina Russo*. "Integrating disciplines in a plant chemistry laboratory module to enhance interdisciplinary and scientific thinking in undergraduate students." ..... *ChemRxiv*
-Role: Developed and administered the lab module over two years, prepared the figures and wrote the manuscript.

Peer-reviewed Publications

2019 [14] Gianfranco Diretto, Sarah Frusciante, Claudia Fabbri, Nicolas Schauer, **Lucas Busta**, Zhonghua Wang, Antonio Matas, Alessia Fiore, Jocelyn Rose, Alisdair Fernie, Reinhard Jetter, Benedetta Mattei, Jim Giovannoni, Giovanni Giuliano*. "Manipulation of β-carotene levels in tomato fruits results in increased ABA content and extended shelf-life" .... *PLANT BIOTECHNOLOGY JOURNAL*, *accepted* ..... *I.F. 6.8*
-Role: Chemical analyses and figure preparation, edited the manuscript.

2019 [13] Tao Feng, Ya Yang, **Lucas Busta**, Edgar B. Cahoon, Hengchang Wang, Shiyou Lü*. "Lineage specific gene radiations and positive selection on FAD2 underlie the origin of polyacetylene metabolism in campanulids" *PLANT PHYSIOLOGY*, *accepted* ..... *I.F. 6.4*
-Role: Literature survey, genet database creation, idea formulation, manuscript revision

2018 [12] **Lucas Busta**, Won Cheol Yim, Evan LaBrant, Peng Wang, John C. Cushman, Patricia Santos, Dylan Kosma, and Edgar B. Cahoon*. "Identification of genes encoding enzymes catalyzing the early steps of carrot polyacetylene biosynthesis" *PLANT PHYSIOLOGY*, 178:4, pp.1507-1521 ..... *I.F. 6.4*
-Role: Structural and quantitative chemical analyses, gene cloning, vector construction, heterologous expression, prepared figures, wrote the manuscript.

2018 [11] Xiangjun Li, Alicen M. Teitgen, Asghar Shirani, Juan Ling, **Lucas Busta**, Rebecca E. Cahoon, Wei Zhang, Zaiyun Li, Kent D. Chapman, Diana Berman, Chunyu Zhang*, Robert E. Minto*, and Edgar B. Cahoon*. "Discontinuous Elongation Generates Novel Fatty Acid Hydroxylation and Seed Oil Functionality" *NATURE PLANTS*, 4: 711- 720 ..... *I.F. 10.3*
-Role: Create phylogenetic trees, edited manuscript.

2018 [10] Yanjun Guo, June Li, **Lucas Busta**, Reinhard Jetter*. "Coverage and composition of cuticular waxes on the fronds of the temperate ferns *Pteridium aquilinum*, *Cryptogramma crispa*, *Polypodium glycyrrhiza*, *Polystichum munitum* and *Gymnocarpium dryopteris*" *ANNALS OF BOTANY*, 122: 555 - 568 ..... *I.F. 4.0*
-Role: Helped analyze, organize data, contributed substantially to manuscript preparation.

2018 [9] Ok Tae Kim, Yurry Um, Mei Lan Jin, Young Chang Kim, Kyong Hwan Bang, Daniela Hegebarth, **Lucas Busta**, Radu Racovita, Reinhard Jetter. "A Novel Multifunctional C-23 Oxidase, CYP714E19, is Involved in Asiaticoside Biosynthesis" *PLANT AND CELL PHYSIOLOGY*, 59(6): 1200 - 1213 ..... *I.F. 4.7*
-Role: Helped analyze data, edited manuscript.

†co-first authors
*corresponding author

2018 [8] Tongjun Sun, **Lucas Busta**, Pingtao Ding, Reinhard Jetter, and Yuelin Zhang*. "Arabidopsis Transcription factors TGA1 and TGA4 regulate salicylic acid and pipecolic acid biosynthesis by modulating the expression of *SARD1* and *CBP60g*." *NEW PHYTOLOGIST* 217: 344-354 ..... *I.F. 7.3*
-Role: Quantified amino acids with gas chromatography-mass spectrometry, edited paper.

2017 [7] **Lucas Busta** and Reinhard Jetter*. "Moving beyond the ubiquitous: the structural diversity and biosynthesis of specialty plant wax compounds" *PHYTOCHEMISTRY REVIEWS*, 1-30 ..... *I.F. 3.4*
-Role: Performed comprehensive chemical structure searches, literature review, organized large chemical dataset, prepared extensive data tables and figures, wrote manuscript.

2017 [6] Yanjun Guo†, **Lucas Busta**†, and Reinhard Jetter*. "Composition of cuticular wax differs among organs of *Taraxacum officinale*." *PLANT PHYSIOLOGY AND BIOCHEMISTRY*, 115: 372-379 ..... *I.F. 2.7*
-Role: Helped analyze and organize data, identify new compounds, prepare figures, and contributed substantially to manuscript preparation.

2017 [5] **Lucas Busta*** and Reinhard Jetter. "The structure and biosynthesis of branched wax compounds on *Arabidopsis thaliana*." *PLANT AND CELL PHYSIOLOGY*, 58(6): 1059-1074 ..... *I.F. 4.7*
-Role: Analyzed chemical extracts from eight plant lines, identified new chemical constituents and synthesized authentic standards, prepared figures and wrote manuscript.

2016 [4] **Lucas Busta**†, Daniela Hegebarth†, Edward Kroc, Reinhard Jetter*. "Changes in cuticular wax coverage and composition on developing Arabidopsis leaves are influenced by wax biosynthesis gene expression levels and trichome density." *PLANTA*, 245(2): 297-311 ..... *I.F. 3.3*
-Role: Performed extremely detailed chemical analyses of extracts from various plant lines and tissues of different ages. Prepared figures and wrote manuscript.

2016 [3] Pingtao Ding†, Dmitrij Rekhter†, Yuli Ding†, Kirstin Feussner, **Lucas Busta**, Sven Haroth, Shaohua Xu, Xin Li, Reinhard Jetter, Ivo Feussner, Yuelin Zhang*. "Systemic Acquired Resistance Deficient 4 encodes a key enzyme for pipecolic acid biosynthesis." *PLANT CELL*, 28(10): 2603-2615 ..... *I.F. 8.7*
-Role: Quantified amino acids with gas chromatography-mass spectrometry, edited paper.

2016 [2] **Lucas Busta**, Jessica M. Budke, Reinhard Jetter*. "Cuticular wax coverage on *Funaria hygrometrica* is similar to vascular plants, but wax composition differs between surfaces of the leafy gametophyte, calyptra, and sporophyte capsule." *ANNALS OF BOTANY*, 118(3): 511-22 ..... *I.F. 4.0*
-Role: Performed detailed chemical analyses of surface extracts sent by a collaborator. Prepared figures and wrote manuscript.

2016 [1] **Lucas Busta**, Jessica M. Budke, Reinhard Jetter*. "Identification of β-hydroxy fatty acid esters and primary, secondary-alkanediol esters in cuticular waxes of the moss *Funaria hygrometrica*." *PHYTOCHEMISTRY*, 121: 38-49 ..... *I.F. 3.2*
-Role: Performed detailed chemical analyses of surface extracts sent by a collaborator, identified new compounds and synthesized authentic standards for structural confirmation. Prepared figures and wrote manuscript.

†co-first authors
*corresponding author

Funding **(Total = $216,000)**

- NSF Postdoctoral Research Fellowship in Biology ($216,000) ..... 2018 - present
  -Title: Genes controlling wax biosynthesis in *Sorghum bicolor*: potential for improving crop performance and value.
  -Role: Principal Investigator: sole proposal writer, primary performer of experiments and analyses, annual report writer, project conception and management, equipment and supplies acquisition, personnel training and management, budget management.

Awards **(Total = 18; $2,750)**

Major Research Awards

- American Chemical Society CAS SciFinder Future Leaders Award ($1000) 2019
  -Description: Internationally competitive award, brings awardee to CAS headquarters for one week and to American Chemical Society national meeting, three-year ACS membership

Competitive Research and Presentation Awards

- Phytochemical Society of North America Best Postdoctoral Poster Award ($250) 2019
- Univ. of Nebraska - Lincoln Postdoc Science Slam Champion ($750) 2017
- Phytochemical Society of North America Best Postdoctoral Poster Award ($250) 2017
- American Society of Plant Biologists Plantae Fellowship ($100) 2017
- Phytochemical Society of North America Best Oral Presentation Award ($250) 2013
- Univ. of Minnesota - Duluth Casmir Ilenda Award for Undergrad. Research ($150) 2011
- Univ. of Minnesota - Duluth F.B. Moore Academic and Leadership Award 2011
- Univ. of Minnesota - Duluth ACS Division of Analytical Chemistry Award 2010
- Univ. of Minnesota - Duluth James H. Maguire Award 2009, 2010

Teaching Awards and Certificates

- Associate at Center for the Integration of Research, Teaching, and Learning 2017
- Univ. of Minnesota - Duluth Chem. Biochem. Outstanding Undergrad. Teaching Asst . 2011

Travel Awards, Competitive and Merit-based

- Phytochemical Society of North America Postdoctoral Travel Award ($300) 2019
- Univ. of Nebraska - Lincoln Center for Plant Science Innovation Travel Award ($500) .. 2018
- Phytochemical Society of North America F. & M. Loewus Travel Award ($200) ... 2016, 2017
- Univ. of British Columbia Graduate Student Travel Award ($500) 2016

Interviews and Science Communication

- Podcast interviewee on *In Defense Of Plants* 2018
  -Role: Was interviewed for one hour over Skype. The conversation was later turned into a podcast on the popular channel "In Defense of Plants".
- Scientific Twitter blog writer at @PlantsRChemists, #PhytochemicalFriday ... 2018 - present
  -Role: Feature a phytochemical in a Twitter post every Friday, highlighting features interesting to lay readers. >1,300 followers.
- Scientific blog writer at `plantsarechemists.blogspot.com` ..... 2016 - present
  -Role: Write blog articles about plant chemistry in plants' and humans' daily lives. Written for the lay reader. >7,000 reads.
- GC-MS maintenance video channel on YouTube ..... 2016 - present
  -Role: Prepare and upload detailed, step-by-step videos on how to maintain and repair a GC-MS system. >18,000 views.

Presentations

Invited Oral Presentations

2019 **Lucas Busta** "Analytical Chemistry in the Age of Genomics: Quantitative and Structural Analyses to Understand Metabolism and Fuel a Bio-based Economy." Invited presentation, *DEPARTMENTS OF BIOLOGY AND CHEMISTRY JOINT SEMINAR, THE UNIVERSITY OF MINNESOTA - DULUTH*, Duluth, MN. Host: Prof. Steve Berry and Prof. Jennifer Liang

2019 **Lucas Busta** "Opening new research avenues by creating links between disparate data repositories." Invited presentation, *SUPERCOMPUTING AND LIFE SCIENCES SYMPOSIUM 2019, THE UNIVERSITY OF NEBRASKA - LINCOLN*, Lincoln, NE. Host: Dr. Jennifer Clarke

2019 **Lucas Busta** "Fatty acids: a metabolic starting point for plant chemicals with diverse functions both above and below ground." Invited departmental seminar, *DEPT. OF BIOCHEMISTRY, THE UNIVERSITY OF NEBRASKA - LINCOLN*, Lincoln, NE. Host: Prof. Edgar Cahoon

2018 **Lucas Busta** "Fatty acids: a metabolic starting point for plant chemicals with diverse functions both above and below ground." Invited graduate seminar, *DEPT. OF BIOLOGY, THE UNIVERSITY OF NEBRASKA - OMAHA*, Omaha, NE. Host: Prof. Roxi Kellar

2018 **Lucas Busta** "Phytochemical structures and occurrence across plant diversity as a tool for biosynthetic pathway discovery." Invited departmental seminar, *DEPT. OF BIOCHEMISTRY, THE UNIVERSITY OF NEVADA - RENO*, Reno, NV. Host: Prof. Dylan Kosma

2016 **Lucas Busta** "The diversity and biosynthesis of cuticular waxes." Invited special seminar, *THE BOYCE THOMPSON INSTITUTE*, Ithaca, NY. Host: Prof. James Giovannoni (National Academy of Sciences)

2016 **Lucas Busta** "The diversity and biosynthesis of cuticular waxes." Invited special seminar, *THE CENTER FOR PLANT SCIENCE INNOVATION*, Lincoln, NE. Host: Prof. Edgar Cahoon

Oral and Poster Presentations

2019 **Lucas Busta**, Elizabeth Schmitz, Chi Zhang, David Holding, Edgar Cahoon: "Composition and genomics of surface chemicals on grain of sorghum bicolor and related grasses" Poster Presentation, *CENTER FOR PLANT SCIENCE INNOVATION 2019 SYMPOSIUM*, Lincoln, NE

2019 **Lucas Busta**, Elizabeth Schmitz, Chi Zhang, David Holding, Edgar Cahoon: "Composition and genomics of surface chemicals on grain of sorghum bicolor and related grasses" Poster Presentation, *PHYTOCHEMICAL SOCIETY OF NORTH AMERICA*, Johnson City, TN

2019 **Lucas Busta**, Won Cheol Yim, Evan William LaBrant, Patricia Santos, Dylan K. Kosma, Edgar B. Cahoon: "The diversity, activity, biosynthesis, and evolution of bioactive polyacetylenes in *Daucus carota*", Oral Presentation, *PHYTOCHEMICAL SOCIETY OF NORTH AMERICA*, Johnson City, TN

2018 **Lucas Busta**, Won Cheol Yim, Evan William LaBrant, Lindsey Grimes, Zach Wahrenburg, Peng Wang, Patricia Santos, Dylan K. Kosma, Edgar B. Cahoon: "The diversity, activity, and biosynthesis of bioactive polyacetylenes in *Daucus carota*", Oral Presentation, *BOTANICAL SOCIETY OF AMERICA*, Rochester, MN

2018 **Lucas Busta**, Won Cheol Yim, Evan William LaBrant, Lindsey Grimes, Zach Wahrenburg, Peng Wang, Patricia Santos, Dylan K. Kosma, Edgar B. Cahoon: "The diversity, activity, and biosynthesis of bioactive polyacetylenes in *Daucus carota*", Oral Presentation, *INTERDISCIPLINARY PLANT GROUP MEETING 2018*, Columbia, MO †

2018 **Lucas Busta**: "Genes controlling wax biosynthesis in *Sorghum bicolor*: potential for improving crop performance and value", Poster, *PLANT GENOME RESEARCH PROGRAM AWARDEE MEETING*, Washington, DC

2018 Nancy Nguyen, Caleb Wehling, **Lucas Busta**, Edgar Cahoon, Wayne Reikhoff: "Defining the mechanism of action of plant-derived polyacetylene antifungal compounds", Poster, *UNL UCARE SYMPOSIUM*, Lincoln, NE

2017 **Lucas Busta** "Now is the most exciting time yet to be a (plant) scientist." Invited workshop presentation, *THE UNIVERSITY OF NEBRASKA - LINCOLN*, Lincoln, NE.

2017 **Lucas Busta**, Evan LaBrant, Lindsey Grimes, Patricia Santos, Dylan Kosma, Edgar Cahoon: "Bioactivity, structure, and biosynthesis of polyacetylenes", Poster, *PHYTOCHEMICAL SOCIETY OF NORTH AMERICA*, Columbia, MO ‡ §

2017 **Lucas Busta**, Evan LaBrant, Lindsey Grimes, Patricia Santos, Dylan Kosma, Edgar Cahoon: "Structure and biosynthesis of bioactive polyacetylenes", Poster, *NEBRASKA RESEARCH & INNOVATION CONFERENCE: PREDICTIVE CROP DESIGN: GENOME TO PHENOME*, Lincoln, NE

2017 **Lucas Busta**, Evan LaBrant, Lindsey Grimes, Patricia Santos, Dylan Kosma, Edgar Cahoon: "Structure and biosynthesis of bioactive polyacetylenes", Poster, *NEBRASKA SYMPOSIUM ON PLANT BREEDING*, Lincoln, NE

2017 **Lucas Busta** and Reinhard Jetter: "Digging for buried treasure in a chemical diversity database", Oral Presentation, *PHYTOCHEMICAL SOCIETY OF NORTH AMERICA*, Columbia, MO

2016 **Lucas Busta**, Reinhard Jetter: "Structure and biosynthesis of branched cuticular wax compounds", Poster, *PHYTOCHEMICAL SOCIETY OF NORTH AMERICA*, Davis, CA

2015 **Lucas Busta**, Jessica M. Budke, Reinhard Jetter: "Cuticular waxes from the leafy gametophyte, sporophyte, and calyptra of the moss *Funaria hygrometrica*", Oral Presentation, *BOTANICAL SOCIETY OF AMERICA*, Edmonton, AB

2013 **Lucas Busta**, Jessica M. Budke, Reinhard Jetter: "Hydroxy esters from the gametophyte, sporophyte, and calyptra of the moss *Funaria hygrometrica*", Oral Presentation, *PHYTOCHEMICAL SOCIETY OF NORTH AMERICA*, Corvallis, OR ‡

2011 **Lucas Busta**, Evan Anderson, John F. Evans: "Development of a Time Domain Reflectometry System for the Determination of Ice Formation on Road and Bridge Surfaces", Oral Presentation, *SPRING UNDERGRADUATE RESEARCH SYMPOSIUM*, University of Minnesota Duluth, Duluth, MN

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†selected for oral presentation from among poster abstracts

‡awarded

§presented in Spanish

Academic and University Service

Ad hoc Reviewer

- *ACS Journal of Agricultural and Food Chemistry* (I.F. 3.1) Number of articles: 1 . . 2019 - present
- *ACS Applied Materials & Interfaces* (I.F. 8.1) Number of articles: 1 . . . . . 2019 - present
- *Scientific Reports* (I.F. 4.1) Number of articles: 1 . . . . . 2019 - present
- *Journal of Integrative Agriculture* (I.F. 1.1) Number of articles: 1 . . . . . 2019 - present
- *Plant Physiology and Biochemistry* (I.F. 2.8) Number of articles: 2 . . . . . 2018 - present
- *Functional Plant Biology* (I.F. 2.5) Number of articles: 1 . . . . . 2018 - present
- *Plant Physiology* (I.F. 6.4) Number of articles: 2 . . . . . 2018 - present
- *Lipids* (I.F. 1.9) Number of articles: 1 . . . . . 2018 - present
- *Horticulture Research* (I.F. 4.2) Number of articles: 1 . . . . . 2018 - present
- *Plant Cell Reports* (I.F. 3.1) Number of articles: 1 . . . . . 2017 - present

Scientific Society Memberships

- American Chemical Society . . . . . 2019 - present
- American Society of Plant Biologists . . . . . 2018 - present
- Botanical Society of America . . . . . 2018 - present
- Phytochemical Society of North America . . . . . 2013 - present

Committee Service

- Phytochemical Society of North America Young Member's Committee . . . . . 2019 - present
  -Role: Organize panel discussion at annual meeting. Nominated by senior society members.
- UNL Plant Science Student and Postdoc Society Secretary . . . . . 2018 - 2019
  -Role: Host invited speakers (4), organize workshops (2), host social events (3), coordinate outreach events (1). 40 members. Nominated and elected by peers.

Volunteering

- Fascination of Plants Day (Univ. of Nebraska - Lincoln) 2017, 2019
  -Role, duration: Help high schoolers perform thin layer chromatography separations and learn about polarity, 3 hrs.
- NSF Outreach Day (Univ. of Nebraska - Lincoln) 2017, 2019
  -Role, duration: Assist local high school students to separate natural dyes using column chromatography and TLC to learn about polarity, 3 hrs.
- Women In Science Weekend (Univ. of Nebraska - Lincoln) 2017, 2019
  -Role, duration: Assist young women from rural highschools perform thin layer chromatography separations and learn about polarity, 3 hrs.
- Sunday with a Scientist (Local Natural History Museum) 2017, 2018
  -Role, duration: 2017: Designed and ran an activity booth for children to explore plant chemistry using starch dyes, thin layer chromatography separations, and microscopy, 4 hrs. 2018: Designed and ran a Saturday morning science activity booth for children where they used plant extracts as indicators to explore the pH of common solutions, 2 hrs.

Professional References

Primary references

Dr. Edgar Cahoon .....Dept. of Biochemistry, Univ. of Nebraska - Lincoln
-Position: Professor of Biochemistry, Director of Center for Plant Science Innovation
-Relationship: Mentor during postdoctoral work
-Contact: ecahoon2@unl.edu; (402) 472 5611
-Address: E318 1901 Vine St., Lincoln, NE 68588

Dr. Reinhard Jetter ..... Dept. of Chemistry & Dept. of Botany, Univ. of British Columbia
-Position: Professor of Chemistry, Professor of Botany
-Relationship: PhD supervisor
-Contact: jetter@mail.ubc.ca; (604) 822 2477
-Address: 6270 Univ. Blvd, Vancouver, BC V6T 1Z4

Dr. Sabrina Russo .....School of Biological Sciences, Univ. of Nebraska - Lincoln
-Position: Associate Professor of Biology
-Relationship: Instructor of "Plants in Human Medicine" course, in which I serve as a guest lesson writer, lecturer, and lab activity coordinator
-Contact: srusso2@unl.edu; (402) 472 8387
-Address: 402 Manter Hall, Lincoln, NE 68588

Additional references

Prof. Jessica Budke Dept. of Ecology & Evolutionary Biology, Univ. of Tennessee - Knoxville
-Position: Assistant Professor and Herbarium Director
-Relationship: Collaborator at University of Tennessee
-Contact: jbudke@utk.edu; (865) 974-6204
-Address: 569 Dabney Hall, 1416 Circle Dr, Knoxville, TN 37996

Prof. Dylan Kosma Department of Biochem. and Molecular Biology, Univ. of Nevada - Reno
-Position: Assistant Professor of Biology
-Relationship: Collaborator at University of Nevada
-Contact: dkosma@unr.edu; (775) 682 7319
-Address: Mail Stop 221, 1664 N. Virginia Street Reno, NV 89557

Prof. Wayne Riekhof .....School of Biological Sciences, Univ. of Nebraska - Lincoln
-Position: Associate Professor of Biology
-Relationship: Collaborator at University of Nebraska
-Contact: wriekhof2@unl.edu; (402) 472 8895
-Address: E141 1901 Vine St., Lincoln, NE 68588

Prof. Argelia Lorence ..... Department of Chemistry and Physics, Arkansas State Univ.
-Position: Professor of Metabolic Engineering; Director, Arkansas State Phenomics Facility
-Relationship: Collaborator at Arkansas State University
-Contact: alorence@astate.edu; (870) 680 4322
-Address: 310 Arkansas Biosciences Institute, Little Rock, AR 72205

Appendix

Research Training

2019 **Panel Discussion on Time Management Skills** ..... Association of Women in Science
-Focus, duration: Work-life balance as a young professor, 1 hr.
2018 **NSF Broader Impacts Training** ..... National Alliance for Broader Impacts
-Focus, duration: How to write a competitive "Broader Impacts" proposal section, 6 hrs.
2018 **Workshop: "Preparing Postdocs to be Professors"** ..... UNL
-Focus, duration: Strategies for acquiring an assistant professor position, 1.5 hrs.
2017 **Workshop on Emotional Intelligence in the Workplace** ..... UNL
-Focus, duration: Techniques for assessing and improving emotional intelligence, 8 hrs.
2017 **Science Communication and Policy Bootcamp** ..... American Institute of Biol. Sci.
-Focus, duration: Effectively communicating science to the public & lawmakers, 7 hrs.
2017 **Metabolomics Workshop** ..... Waters Instruments and UNL Center for Biotechnology
-Focus, duration: Sample preparation, data acquisition, processing, and analysis, 9 hrs.
2017 **Social Media and Communicating Science Workshop** ..... UNL
-Focus, duration: Effectively communicating science to the public via social media, 2 hrs.
2017 **Workshop on Budget Development** ..... UNL
-Focus, duration: How to write a budget for a grant proposal, 2.5 hrs.
2017 **Write Winning Grant Proposals Seminar** ..... UNL
-Focus, duration: How to write a successful grant proposal to any agency, 7 hrs.
2016 **Bioinformatics for Evolutionary Biology** ..... UBC Biology 525D
-Focus, duration: Ways to learn about evolution using sequence data, 20 hrs.
2016 **R Carpentry Workshop** ..... UBC
-Focus, duration: Basics of statistical computing in R, 12 hrs.
2012 **Physical and Analytical Chemistry Seminar** ..... UBC Chemistry 540A
-Focus, duration: How to give an effective presentation about analytical research, 24 hrs.
2012 **Principles of Chemical Separation** ..... UBC Chemistry 534
-Focus, duration: Theoretical basis for separation chemistry, 72 hrs.
2011 **Bioanalytical Chemistry** ..... UBC Chemistry 533
-Focus, duration: Practicing analytical chemistry on biological systems, 72 hrs.
2011 **Advanced Bioorganic Chemistry** ..... UBC Chemistry 569
-Focus, duration: Mechanisms by which biological systems catalyze organic reactions, 72 hrs.

Teaching and Mentoring Training

2019 **Teaching Statement Workshop** ..... CIRTL
-Focus, duration: How to prepare a quality teaching statement, 3 hrs.
2019 **Leading Without Authority** ..... ACS
-Focus, duration: Methods for delegating tasks in ways that benefit all involved, 4 hrs.
2019 **Coaching Workshop** ..... SciTrain
-Focus, duration: Techniques for coaching highly motivated students to bring out full potential, 8 hrs.
2018 **Mentoring and Advising Workshop** ..... CIRTL
-Focus, duration: Strategies for providing quality mentorship to mentees with diverse backgrounds and learning styles, 2 hrs.
2018 **Teaching Portfolio Workshop** ..... UNL
-Focus, duration: How to prepare a quality teaching portfolio, 2 hrs.
2017 **Workshop on Teaching Statement Preparation** ..... UNL
-Focus, duration: How to prepare a quality teaching statement, 1 hr.
2016 **Instructional Skills Workshop** ..... UBC

-Focus, duration: Active and participatory learning and teaching techniques, 24 hrs.

2016 **Writing Across the Curriculum Workshops** ..... UBC
-Focus, duration: Literature-based methods for teaching scientific writing, 7 hrs.

2015 **Teaching Assistant Peer-Mentor Training** ..... UBC
-Focus, duration: Skills to train others in overseeing lessons, mentorship, and teaching, 6 hrs.

2011 **Teaching Assistant Training** ..... UBC
-Focus, duration: Basic skills for teaching assistants in scientific laboratories, 4 hrs.

Additional Teaching Experience

Teaching Assistant

- Chemistry 311: Analytical Chemistry Lecture II (U. British Columbia) 2016
  -Audience, duration: 2016: 90 students, 1 semester
  -Role: Designed small-group active learning modules & problem sets. Topics: Properties of light, spectrometry, chromatography, and electrochemistry.
- Chemistry 311: Analytical Chemistry Lab II (U. British Columbia) 2013, 2015
  -Audience, duration: 2013-15: 6–12 undergrad. students, 3 semesters
  -Role: Instrument operation and usage as applied to practical problems. Gas chromatography - mass spectrometry, fluorometry, cyclic voltammetry, and atomic emission spectroscopy.
- Chemistry 235: Organic Chemistry Lab II (U. British Columbia) ..... 2013 - 2014
  -Audience, duration: 15 students, 2 semesters
  -Role: Basic chemical reactions and work-ups.
- Chemistry First Year Resource Centre (U. British Columbia) ..... 2011 - 2012
  -Audience, duration: 5–10 undergraduate students, 2 semesters
  -Role: Used guided inquiry to help first year chemistry students with general chemistry problem sets.
- Chemistry 2223: Analytical Chemistry I (U. Minnesota - Duluth) ..... 2009 - 2011
  -Audience, duration: 20 undergraduate students, 4 semesters
  -Role: Helped students conduct experiments related to quantitation, spectrochemistry, and chromatography. Graded exams.

Other Teaching Experience

Professional Online Chemistry and Biology Subject Tutor and Lecturer ..... 2016 - 2018
-Company: `oneclass.com`
-Audience, duration: Undergraduate student subscribers, primarily international students; 4 semesters
-Role: Invited to be an online chemistry and biology tutor and lecturer. Answered students' chemistry and biology questions 1-on-1 via written online interface and delivered virtual lectures (3, 1 hr. each) on general chemistry and biology topics.

Departmental R Programming Club Instructor (U. Nebraska - Lincoln) 2017-2019
-Audience, duration: 20 graduate, undergraduate students, and postdocs; 3 lessons, 1.5 hr. ea.
-Lecture titles: "Data Wrangling in R", and "Using R to construct and annotate phylogenies."
-Role: Designed and delivered lessons on data processing and constructing and annotating phylogenetic trees in the programming language R based on the book "Programming in R" by Hadley Wickham and software manuals of four "R" packages (phangorn, ape, ggtree, phytools).